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A STUDY OF SPOTTED OWL DEMOGRAPHICS IN THE SIERRA NATIONAL
FOREST AND SEQUOIA AND KINGS CANYON NATIONAL PARKS

by

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INTRODUCTION

This report summarizes key activities and preliminary results of demographic studies of spotted owls in the Sierra National Forest (SNF) and the Sequoia/Kings Canyon National Parks (SNP) for 1995. The demographic studies were initiated in March of 1990 and will allow comparisons between spotted owl demographics in a managed National Forest and protected forests of the National Park. An additional study area (New Sierra (NS)) was initiated adjacent to the SNF to provide complete coverage of the Kings River Ecological Management area. Results from NS are also provided in this report. All tables and figures have been updated to reflect the current analysis of data for all years (1990-1995). This report supersedes all previous annual reports.

OBJECTIVES

1. Estimate densities of spotted owls and occupancy status of owl territories in the designated study areas.
2. Estimate vital rates (reproduction, mortality), by age class.
3. Assess site fidelity among individual spotted owls.
4. Estimate turnover rates (reoccupation of territories vacated during the study).
5. Quantify the distribution of vegetative habitats within the study areas.
6. Characterize diets of spotted owls from regurgitated pellets, and compare diets of breeding and nonbreeding pairs during the breeding period (1 March to 30 September).

STUDY AREA

Boundaries of study areas were delineated on major topographic features such as ridges, drainages (major rivers), and administrative boundaries (eg. Sequoia and Kings Canyon National Parks boundaries). The SNF study area covers 161 mi², NS study area covers 103 mi² and the SNP study area covers 130 mi² (Fig. 1). Three vegetative types, oak woodland (1,000 to 4,000 feet), mid-elevation coniferous forest (4,000 to 8,000 feet) and high elevation coniferous forest (8,000 to 9,600 feet) are found in all study areas. A detailed description of these vegetation types and the area they occupy for the SNF and SNP can be found in the 1990 annual report (Verner et al. 1990). For the NS study area the oak-woodland type encompasses 11 mi² (28 km²), the mid-elevation coniferous forest occupies 69 mi² (179 km²), and the high-elevation coniferous forest covers 23 mi² (60 km²).

METHODS

We attempted to locate, capture and color band all spotted owls within the three study areas. Spotted owls were located by night and day calling surveys using vocal imitations of spotted owls to elicit responses. Survey methods included points, leap-frog road survey, and walking cruises.

The protocols for surveying, determining social, nesting and reproductive can be found in Verner et al. (1990). In general, regardless of study area or year, we attempted to apply equal survey effort over years and study areas. Conditions that may have influenced survey effort were inclement weather conditions, such as high winds or steady rain, and water noise when surveying drainages.

RESULTS

SURVEY

Calling surveys began in all study areas in the first week of March and ended on 30 September. All study areas were divided in smaller subdivision or sites and then an attempt was made to survey all sites within the study areas six times regardless of vegetation type, slope, aspect, or elevation. Total coverage (six full surveys in all sites) remained incomplete for all study areas. Areas not called the full six time were the high elevation sites above 8,000 ft (2,438 m) and sites that had no previous owl detections. Rain and snow during the months of March, April, and May hampered the survey effort.

DETECTION AND CAPTURE

On the SNF, adult and subadult numbers dropped by 14 in 1995 and the number of juveniles produced dropped to just one (Table 1a). Pair numbers dropped to 27 in 1995 and owl numbers and nesting activity was similar to the 1991 season which also had heavy rain during the breeding season. For the six years of the study the SNF has averaged 30.6 pairs of owls per year producing an average of 21 juveniles per year, or 0.69 juveniles per pair per year. In 1995, ten adults and subadults (6 males and 4 females) were captured, three were recaptures of banded birds (one was a 1994 juvenile). In 1995 we found that the percentage of male subadults dropped to 21%, females dropped to 13%. The overall average of adult-subadult was 83-17. All juveniles that were known to have been produced in the study area in 1995 were banded. One hundred and fifteen juveniles have been banded on the SNF study area to date. Of the 114 juveniles banded prior to 1995, 18 have been recaptured, two from 1990, none from 1991, 12 from 1992, three from 1993 and one from 1994. Sex ratio of returned juveniles is 12:6 (male:female). Two of the females fledged in 1992 from the SNF were captured on the SNP study site.

For SNP, the number of adults and subadults increased to 80 in 1995. Three juveniles were fledged in 1995 (Table 1b). The six year average of the number of juveniles fledging per year is 17.5 from an average of 27.8 pairs of owls, or 0.63 juveniles per pair per year (Table 2b). In 1995, 12 adults and subadults (6 males, 5 females, 1 unknown) were banded and one female was recaptured. One hundred and six adults and subadults have been banded on the SNP study area to date. The percent subadults in the population declined from a high of 34% in 1994 to 11% in 1995. Two of three juveniles were captured and banded in 1995 bringing the total juveniles banded to 87. Fourteen cohort banded juveniles have been recaptured as adults or subadults (1 fledged in 1990, 8 fledged in 1992, 4 fledged in 1993 and 1 fledged in 1994). Sex ratio of returning cohorts was 10:4 (male:female).

In NS study area, 33 adult and subadult owls were detected. Three owls were captured and banded, one was a recapture and rebanding of an owl that moved from the SNF. The adult/subadult ratio was 90% to 10% (tables 1c and 2c). One juvenile banded in 1993 on the SNF was captured on the NS. One juvenile was detected and banded.

DENSITY

The SNF study area declined in owl density in 1995 to 0.44 birds per square mile. The SNP study area had an increase in the density of owls to 0.62 birds per square mile in 1995. The NS study site declined from 0.36 to 0.32 birds per square mile.

MISSING, REPLACED AND MOVEMENT

Turnover events included only banded owls that were missing, replaced, or moved from one site to another from the previous year. Data for the SNF are reported in table 4a (1990-1991), table 4b (1991-1992), table 4c (1992-1993), table 4d (1993-1994), and table 4e (1994-1995). For 1994-1995 there were 62 banded owls with confirmed status (either present or a turnover event). Forty-nine owls were present, 13 owls were confirmed missing, eight were replaced and five moved to new sites within the study area. The empirical relocation rate, or the number of banded owls relocated each year from previous year was 82% for 1991, 85% for 1992, 86% for 1993, 78% for 1994, and 79% for 1995 (Tables 5a, 5b, 5c, 5d, and 5e). The average relocation rate for the time period of 1990 - 1995 was 81.8%.

Missing, replaced, and movement data for the SNP are reported in table 6a (1990-1991), table 6b (1991-1992), table 6c (1992-1993), table 6d (1993-1994) and 6e (1994-1995). In 1994-1995 there were 62 banded owls with confirmed status. Fifty-three owls were present, nine were missing, six were replaced, and no movements were recorded within the study area. The empirical relocation rate, or the number of banded owls relocated each year from previous year was 82% for 1991, 83% for 1992, 94% for 1993, 84% for 1994, and 85% for 1995 (Tables 7a, 7b, 7c, 7d, and 7e). The average relocation rate for the time period of 1990 - 1995 was 86.2%.

REPRODUCTION AND NESTING ATTEMPTS

The proportion of owl pairs nesting on the SNF, as determined by protocol, was 26% for 1995 (Table 8a) with a six year average of 60%. The proportion of owls checked for reproduction by July 15, which fledged young, was 4% in 1995 (Table 9a) and the number of young fledged per pair that was checked for reproduction was 0.04 in 1995 (Table 10a). The average number of young fledged per successful reproductive pair was 1.00 in 1995 (Table 11a). The five year average of young fledged per successful pair on the SNF is 1.49. The fecundity rate for the SNF was 0.41 (fecundity = the expected number of female fledglings produced per female per year, assuming a 50:50 sex ratio in juvenile spotted owls).

In the SNP the proportion of owl pairs nesting as determined by protocol was 16% for 1995 (Table 8b), and the six year average was 52%. The proportion of owls checked for reproduction by July 15 that fledged young was 6% for 1995 (Table 9b) and the mean number of young fledged per pair checked for reproduction was 0.09 for 1995 (Table 10b). The average number of young fledged per successful reproductive pair was 1.50 for 1995 (Table 11b). The six year average of young fledged per successful pair on the SNP is 1.66. The fecundity rate for the SNP was 0.358 (fecundity = the expected number of female fledglings produced per female per year, assuming a 50:50 sex ratio in juvenile spotted owls).

DISCUSSION

Findings of particular interest were the low proportion of fledged young in both study areas in 1995. This is similar to the results we found in 1991. Both years had heavy spring rains during the nesting period. Also of interest is the decline in owl numbers on the SNF, while the SNP increased in numbers in 1995. Equal efforts were made in both study areas to locate owls so we don't believe the decline on the SNF is a result of sampling. Relocation of banded birds has been lower on the SNF for the last three years (1993, 1994, and 1995) than the relocation rates on the SNP.

LITERATURE CITED

- Verner, Jared, G. N. Steger, G. P. Eberlein D. A. Leal, and T. E. Munton. 1991. Part 1: Spotted Owl home-range size and composition in the Sierra National Forest. Part 2: Demography of spotted owls in the Sierra National Forest and Sequoia/Kings Canyon National Parks. Annual Progress Report 1990. Internal Report, Pacific Southwest Forest and Range Experiment Station, Fresno, California. 9 pp.

TABLE 1a. Summary of social status of California spotted owls on the Sierra National Forest, 1990 - 1995.

SOCIAL STATUS	1990	1991	1992	1993	1994	1995
ADULT AND SUBADULT						
PAIR	31	27	32	33	34	27
SINGLE MALE	0	2	1	4	4	3
SINGLE FEMALE	0	0	1	1	0	1
MALE & FEMALE PRESENT	5	0	1	1	1	2
MALE PRESENT	9	10	1	4	8	5
FEMALE PRESENT	4	3	3	2	0	3
UNKNOWN				1	2	0
TOTAL NUMBER OF OWLS	85	69	72	80	84	70
JUVENILES	22	7	53	23	20	1
		(6+1)	(52+1)			

TABLE 1b. Summary of social status of California spotted owls on the Sequoia Kings Canyon National Parks, 1990 - 1995.

SOCIAL STATUS	1990	1991	1992	1993	1994	1995
ADULT AND SUBADULT						
PAIR	22	23	27	28	34	33
SINGLE MALE	0	0	0	0	0	0
SINGLE FEMALE	0	1	0	0	0	1
MALE & FEMALE PRESENT	2	5	0	2	0	2
MALE PRESENT	5	1	5	4	4	6
FEMALE PRESENT	1	0	0	2	2	1
UNKNOWN PRESENT	0	2	1	1	0	2
FEMALE REPLACED					1	
TOTAL NUMBER OF OWLS	54	60	60	67	75	80
JUVENILES	21	1	43	15	22	3
	(12+9)					

TABLE 1c. Summary of social status of California spotted owls on the New Sierra Study Area 1994 - 1995

SOCIAL STATUS	1994	1995
ADULT AND SUBADULT		
PAIR	15	14
SINGLE MALE	0	0
SINGLE FEMALE	1	1
MALE & FEMALE PRESENT	0	0
MALE PRESENT	3	1
FEMALE PRESENT	2	1
UNKNOWN PRESENT	1	2
FEMALE REPLACED	0	0
TOTAL NUMBER OF OWLS	37	33
JUVENILES	11	1
	(9+2)	

TABLE 3.

CRUDE DENSITY

Mean crude density estimates (n per mi^2) for California Spotted Owls on the Sierra National Forest and Sequoia and Kings Canyon National Parks Study Areas, from 1990 through 1995. Crude density was calculated by dividing the number of owls detected by the number of square miles in each study area.

SIERRA STUDY AREA

YEAR	TOTAL AREA	OWLS DETECTED	CRUDE DENSITY/ Mi^2
1990	160.4	85	0.530
1991	160.4	69	0.430
1992	160.4	72	0.449
1993	160.4	80	0.499
1994	160.4	84	0.524
1995	160.4	70	0.436

SEQUOIA/KINGS STUDY AREA

1990	130.0	54	0.415
1991	130.0	60	0.462
1992	130.0	60	0.462
1993	130.0	67	0.515
1994	130.0	75	0.577
1995	130.0	80	0.615

NEW SIERRA STUDY SITE

1994	103	37	0.359
1995	103.0	33	0.320

TABLE 4a. Missing, replaced and inter-site movement rates for only banded California spotted owls on the Sierra National Forest between 1990 and 1991.

Sex	Age Class	No. Banded	MISSING		REPLACED		MOVEMENT	
		1990	N	%	N	%	N	%
Male	Adult	15	3	20	4	27	1	7
	Subadult	5	2	40	2	40	0	0
	Unknown	<u>0</u>	<u>0</u>	00	<u>0</u>	00	<u>0</u>	0
	Total	20	5	25	6	30	1	5
Female	Adult	12	1	8	1	8	1	8
	Subadult	1	0	0	0	0	0	0
	Unknown	<u>0</u>	<u>0</u>	0	<u>0</u>	0	<u>0</u>	0
	Total	13	1	8	1	8	1	8
Both	Adult	27	4	15	5	19	2	7
	Subadult	6	2	33	2	33	0	0
	Unknown	<u>0</u>	<u>0</u>	0	<u>0</u>	0	<u>0</u>	0
	Combined	33	6	18	7	21	2	6

TABLE 4b. Missing, replaced and inter-site movement rates for only banded California spotted owls on the Sierra National Forest between 1991 and 1992.

Sex	Age Class	No. Banded	MISSING		REPLACED		MOVEMENT	
		1991	N	%	N	%	N	%
Male	Adult	17	2	12	2	12	1	6
	Subadult	5	1	20	1	20	2	40
	Unknown	<u>0</u>	<u>0</u>	0	<u>0</u>	0	<u>0</u>	0
	Total	22	3	14	3	14	3	14
Female	Adult	19	3	16	3	16	2	11
	Subadult	0	0	0	0	0	0	0
	Unknown	<u>0</u>	<u>0</u>	0	<u>0</u>	0	<u>0</u>	0
	Combined	19	3	16	3	16	2	11
Both	Adult	36	5	14	5	14	3	8
	Subadult	5	1	20	1	20	2	40
	Unknown	<u>0</u>	<u>0</u>	0	<u>0</u>	0	<u>0</u>	0
	Combined	41	6	15	6	15	5	12

TABLE 4c. Missing, replaced and inter-site movement rates for only banded California spotted owls on the Sierra National Forest between 1992 and 1993.

Sex	Age Class	No. Banded 1992	MISSING		REPLACED		MOVEMENT	
			N	%	N	%	N	%
Male	Adult	26	5	19	5	19	0	0
	Subadult	4	1	25	1	25	0	0
	Unknown	<u>0</u>	<u>0</u>	0	<u>0</u>	0	<u>0</u>	0
	Total	30	6	20	6	20	0	0
Female	Adult	26	2	8	2	8	0	0
	Subadult	1	0	0	0	0	0	0
	Unknown	<u>1</u>	<u>0</u>	0	<u>0</u>	0	<u>0</u>	0
	Combined	28	2	7	2	7	0	0
Both	Adult	52	7	13	7	13	0	0
	Subadult	5	1	20	1	20	0	0
	Unknown	<u>1</u>	<u>0</u>	0	<u>0</u>	0	<u>0</u>	0
	Combined	58	8	14	8	14	0	0

TABLE 4D. Missing, replaced and inter-site movement rates for only banded California spotted owls on the Sierra National Forest between 1993 and 1994.

Sex	Age Class	No. Banded 1993	MISSING		REPLACED		MOVEMENT	
			N	%	N	%	N	%
Male	Adult	22	7	32	6	27	0	0
	Subadult	7	2	29	1	14	1	4
	Unknown	<u>2</u>	<u>0</u>	0	<u>0</u>	0	<u>0</u>	0
	Total	31	9	29	7	23	1	3
Female	Adult	29	5	17	4	14	1	3
	Subadult	2	0	0	0	0	0	0
	Unknown	<u>2</u>	<u>0</u>	0	<u>0</u>	0	<u>0</u>	0
	Combined	33	5	15	4	12	1	3
Both	Adult	51	12	24	10	20	1	2
	Subadult	9	2	22	1	11	1	11
	Unknown	<u>4</u>	<u>0</u>	0	<u>0</u>	0	<u>0</u>	0
	Combined	64	14	22	11	17	2	3

TABLE 4E. Missing, replaced and inter-site movement rates for only banded California spotted owls on the Sierra National Forest between 1994 and 1995.

Sex	Age Class	No. Banded	MISSING		REPLACED		MOVEMENT	
		1994	N	%	N	%	N	%
Male	Adult	20	3	15	2	10	1	5
	Subadult	10	3	30	1	10	0	0
	Unknown	<u>0</u>	<u>0</u>	0	<u>0</u>	0	<u>0</u>	0
	Total	30	6	20	3	10	1	3
Female	Adult	27	6	22	4	15	3	11
	Subadult	4	1	25	1	25	1	25
	Unknown	<u>1</u>	<u>0</u>	0	<u>0</u>	0	<u>0</u>	0
	Combined	32	7	22	5	16	4	13
Both	Adult	47	9	19	6	13	4	9
	Subadult	14	4	29	2	14	1	7
	Unknown	<u>1</u>	<u>0</u>	0	<u>0</u>	0	<u>0</u>	0
	Combined	62	13	21	8	13	5	8

TABLE __. Missing, replaced and inter-site movement rates for only banded California spotted owls on the New Sierra National Forest between 1994 and 1995.

Sex	Age Class	No. Banded	MISSING		REPLACED		MOVEMENT	
		1994	N	%	N	%	N	%
Male	Adult	11	2	18	1	9	0	0
	Subadult	0	0	0	0	0	0	0
	Unknown	<u>2</u>	<u>0</u>	0	<u>0</u>	0	<u>0</u>	0
	Total	13	2	15	1	8	0	0
Female	Adult	9	0	0	0	0	0	0
	Subadult	3	0	0	0	0	0	0
	Unknown	<u>2</u>	<u>0</u>	0	<u>0</u>	0	<u>0</u>	0
	Combined	14	0	00	0	0	0	0
Both	Adult	20	2	10	1	5	0	0
	Subadult	3	0	0	0	0	0	0
	Unknown	<u>4</u>	<u>0</u>	0	<u>0</u>	0	<u>0</u>	0
	Combined	27	2	7	1	4	0	0

TABLE 5a. Empirical relocation rates of banded California spotted owls on the Sierra National Forest between 1990 and 1991.

Sex	Age Class	No. Banded 1990	RELOCATED	
			N	Percent
Male	Adult	15	12	80
	Subadult	5	3	60
	Unknown			
	Total	20	15	75
Female	Adult	12	11	92
	Subadult	1	1	100
	Unknown			
	Total	13	12	92
Both	Adult	27	23	85
	Subadult	6	4	67
	Unknown			
	Combined	33	27	82

TABLE 5b. Empirical relocation rates of banded California spotted owls on the Sierra National Forest between 1991 and 1992.

Sex	Age Class	No. Banded 1991	RELOCATED	
			N	Percent
Male	Adult	17	15	88
	Subadult	5	4	80
	Unknown			
	Total	22	19	86
Female	Adult	19	16	84
	Subadult	0	0	0
	Unknown			
	Total	19	16	84
Both	Adult	36	31	86
	Subadult	5	4	80
	Unknown			
	Combined	41	35	85

TABLE 5c. Empirical relocation rates of banded California spotted owls on the Sierra National Forest between 1992 and 1993.

Sex	Age Class	No. Banded 1992	RELOCATED	
			N	Percent
Male	Adult	26	21	81
	Subadult	4	3	75
	Unknown			
	Total	30	24	80
Female	Adult	26	24	92
	Subadult	1	1	100
	Unknown	1	1	100
	Total	28	26	93
Both	Adult	52	45	87
	Subadult	5	4	80
	Unknown	1	1	100
	Combined	58	50	86

TABLE 5D. Empirical relocation rates of banded California spotted owls on the Sierra National Forest between 1993 and 1994.

Sex	Age Class	No. Banded 1993	RELOCATED	
			N	Percent
Male	Adult	22	15	68
	Subadult	7	5	71
	Unknown	2	2	100
	Total	31	22	71
Female	Adult	29	24	83
	Subadult	2	2	100
	Unknown	2	2	100
	Total	33	28	85
Both	Adult	51	39	76
	Subadult	9	7	78
	Unknown	4	4	100
	Combined	64	50	78

TABLE 5E. Empirical relocation rates of banded California spotted owls on the Sierra National Forest between 1994 and 1995.

Sex	Age Class	No. Banded 1994	RELOCATED	
			N	Percent
Male	Adult	20	17	85
	Subadult	10	7	70
	Unknown	0	0	100
	Total	30	24	80
Female	Adult	27	21	78
	Subadult	4	3	75
	Unknown	1	1	100
	Total	32	25	78
Both	Adult	47	38	81
	Subadult	14	10	71
	Unknown	1	1	100
	Combined	62	49	79

TABLE __. Empirical relocation rates of banded California spotted owls on the New Sierra National Forest between 1994 and 1995.

Sex	Age Class	No. Banded 1994	RELOCATED	
			N	Percent
Male	Adult	11	9	82
	Subadult	0	0	0
	Unknown	2	2	100
	Total	13	11	85
Female	Adult	9	9	100
	Subadult	3	3	100
	Unknown	2	2	100
	Total	14	14	100
Both	Adult	20	18	90
	Subadult	3	3	100
	Unknown	4	4	100
	Combined	27	25	93

TABLE 6a. Missing, replaced and inter-site movement rates for banded California spotted owls on the Sequoia Kings Canyon National Parks between 1990 and 1991.

Sex	Age Class	No. Banded 1990	MISSING		REPLACED		MOVEMENT	
			N	%	N	%	N	%
Male	Adult	9	1	11	1	11	0	0
	Subadult	1	0	0	0	0	1	100
	<u>Unknown</u>	<u>1</u>	<u>0</u>	0	<u>0</u>	0	<u>0</u>	0
	Combined	11	1	9	1	9	1	9
Female	Adult	7	2	29	1	14	0	0
	Subadult	1	0	0	0	0	0	0
	<u>Unknown</u>	<u>3</u>	<u>1</u>	33	<u>1</u>	33	<u>0</u>	0
	Combined	11	3	27	2	18	0	0
Both	Adult	16	3	19	2	13	0	0
	Subadult	2	0	0	0	0	1	50
	<u>Unknown</u>	<u>4</u>	<u>1</u>	25	<u>1</u>	25	<u>0</u>	0
	Combined	22	4	18	3	14	1	5

TABLE 6b. Missing, replaced and inter-site movement rates for banded California spotted owls on the Sequoia Kings Canyon National Parks between 1991 and 1992.

Sex	Age Class	No. Banded 1991	MISSING		REPLACED		MOVEMENT	
			N	%	N	%	N	%
Male	Adult	11	3	27	2	18	0	0
	Subadult	1	0	0	0	0	0	0
	<u>Unknown</u>	<u>3</u>	<u>0</u>	0	<u>0</u>	0	<u>0</u>	0
	Combined	15	3	20	2	13	0	0
Female	Adult	11	2	18	3	27	1	9
	Subadult	2	0	0	0	0	1	50
	<u>Unknown</u>	<u>1</u>	<u>0</u>	0	<u>0</u>	0	<u>0</u>	0
	Combined	14	2	14	3	21	2	14
Both	Adult	22	5	23	5	23	1	5
	Subadult	3	0	0	0	0	1	33
	<u>Unknown</u>	<u>4</u>	<u>0</u>	0	<u>0</u>	0	<u>0</u>	0
	Combined	29	5	17	5	17	2	7

TABLE 6c. Missing, replaced and inter-site movement rates for banded California spotted owls on the Sequoia Kings Canyon National Parks between 1992 and 1993.

Sex	Age Class	No. Banded 1992	MISSING		REPLACED		MOVEMENT	
			N	%	N	%	N	%
Male	Adult	24	0	0	0	0	0	0
	Subadult	0	0	0	0	0	0	0
	<u>Unknown</u>	<u>0</u>	<u>0</u>	0	<u>0</u>	0	<u>0</u>	0
	Combined	24	0	0	0	0	0	0
Female	Adult	23	3	13	3	13	0	0
	Subadult	1	0	0	0	0	0	0
	<u>Unknown</u>	<u>1</u>	<u>0</u>	0	<u>0</u>	0	<u>0</u>	0
	Combined	25	3	12	3	12	0	0
Both	Adult	47	3	6	3	6	0	0
	Subadult	1	0	0	0	0	0	0
	<u>Unknown</u>	<u>1</u>	<u>0</u>	0	<u>0</u>	0	<u>0</u>	0
	Combined	49	3	6	3	6	0	0

TABLE 6D. Missing, replaced and inter-site movement rates for banded California spotted owls on the Sequoia Kings Canyon National Parks between 1993 and 1994.

Sex	Age Class	No. Banded 1993	MISSING		REPLACED		MOVEMENT	
			N	%	N	%	N	%
Male	Adult	26	6	23	5	19	0	0
	Subadult	2	0	0	0	0	0	0
	<u>Unknown</u>	<u>1</u>	<u>0</u>	0	<u>0</u>	0	<u>1</u>	100
	Combined	29	6	21	5	17	1	3
Female	Adult	23	3	13	2	9	0	0
	Subadult	2	0	0	1	50	1	50
	<u>Unknown</u>	<u>1</u>	<u>0</u>	0	<u>1</u>	100	<u>1</u>	100
	Combined	26	3	12	4	15	2	8
Both	Adult	49	9	18	7	14	0	0
	Subadult	4	0	0	1	25	1	25
	<u>Unknown</u>	<u>2</u>	<u>0</u>	0	<u>1</u>	50	<u>2</u>	100
	Combined	55	9	16	9	16	3	5

TABLE 6E. Missing, replaced and inter-site movement rates for banded California spotted owls on the Sequoia Kings Canyon National Parks between 1994 and 1995.

Sex	Age Class	No. Banded 1994	MISSING		REPLACED		MOVEMENT	
			N	%	N	%	N	%
Male	Adult	20	3	15	3	15	0	0
	Subadult	9	1	11	0	0	0	0
	<u>Unknown</u>	<u>0</u>	<u>0</u>	0	<u>0</u>	0	<u>0</u>	0
	Combined	29	4	14	3	10	0	0
Female	Adult	27	4	15	3	11	0	0
	Subadult	3	1	33	0	0	0	0
	<u>Unknown</u>	<u>3</u>	<u>0</u>	0	<u>0</u>	0	<u>0</u>	0
	Combined	33	5	15	3	9	0	0
Both	Adult	47	7	15	6	13	0	0
	Subadult	12	2	17	0	0	0	0
	<u>Unknown</u>	<u>3</u>	<u>0</u>	0	<u>0</u>	0	<u>0</u>	0
	Combined	62	9	15	6	10	0	0

TABLE 7a. Empirical relocation rates of California spotted owls on the Sequoia Kings Canyon National Parks between 1990 and 1991.

Sex	Age Class	No. Banded 1990	RELOCATED	
			N	Percent
Male	Adult	9	8	89
	Subadult	1	1	100
	<u>Unknown</u>	<u>1</u>	<u>1</u>	<u>100</u>
	Combined	11	10	91
Female	Adult	7	5	71
	Subadult	1	1	100
	<u>Unknown</u>	<u>3</u>	<u>2</u>	<u>67</u>
	Combined	11	8	73
Both	Adult	16	13	81
	Subadult	2	2	100
	<u>Unknown</u>	<u>4</u>	<u>3</u>	<u>75</u>
	Combined	22	18	82

Two adult females which were identified in 1989 but not in 1990 were verified as replaced in 1991. They are not included in the above table.

This table includes an adult female that was missing (but not replaced) after a complete survey of its historic site.

Age=previous year

TABLE 7b. Empirical relocation rates of California spotted owls on the Sequoia Kings Canyon National Parks between 1991 and 1992.

Sex	Age Class	No. Banded 1991	RELOCATED	
			N	Percent
Male	Adult	11	8	73
	Subadult	1	1	100
	<u>Unknown</u>	<u>3</u>	<u>3</u>	<u>100</u>
	Combined	15	12	80
Female	Adult	11	9	82
	Subadult	2	2	100
	<u>Unknown</u>	<u>1</u>	<u>1</u>	<u>100</u>
	Combined	14	12	86
Both	Adult	22	17	77
	Subadult	3	3	100
	<u>Unknown</u>	<u>4</u>	<u>4</u>	<u>100</u>
	Combined	29	24	83

TABLE 7c. Empirical relocation rates of California spotted owls on the Sequoia Kings Canyon National Parks between 1992 and 1993.

Sex	Age Class	No. Banded 1992	RELOCATED	
			N	Percent
Male	Adult	24	24	100
	Subadult	0	0	0
	Unknown	0	0	0
	Combined	24	24	100
Female	Adult	23	20	87
	Subadult	1	1	100
	Unknown	1	1	100
	Combined	25	22	88
Both	Adult	47	44	94
	Subadult	1	1	100
	Unknown	1	1	100
	Combined	49	46	94

TABLE 7d. Empirical relocation rates of California spotted owls on the Sequoia Kings Canyon National Parks between 1993 and 1994.

Sex	Age Class	No. Banded 1993	RELOCATED	
			N	Percent
Male	Adult	26	20	77
	Subadult	2	2	100
	Unknown	1	1	100
	Combined	29	23	79
Female	Adult	23	20	87
	Subadult	2	2	100
	Unknown	1	1	100
	Combined	26	23	88
Both	Adult	49	40	82
	Subadult	4	4	100
	Unknown	2	2	100
	Combined	55	46	84

TABLE 7E. Empirical relocation rates of California spotted owls on the Sequoia Kings Canyon National Parks between 1994 and 1995.

Sex	Age Class	No. Banded 1994	RELOCATED	
			N	Percent
Male	Adult	20	17	85
	Subadult	9	8	89
	<u>Unknown</u>	<u>0</u>	<u>0</u>	<u>0</u>
	Combined	29	25	86
Female	Adult	27	23	85
	Subadult	3	2	67
	<u>Unknown</u>	<u>3</u>	<u>3</u>	<u>100</u>
	Combined	33	28	85
Both	Adult	47	40	85
	Subadult	12	10	83
	<u>Unknown</u>	<u>3</u>	<u>3</u>	<u>100</u>
	Combined	62	53	85

TABLE 8a. Proportion of California spotted owl pairs nesting on the Sierra National Forest, 1990 - 1995.

YEAR	<u>PAIRS CHECKED</u> <u>FOR NESTING</u>	<u>PAIRS NESTING</u>	<u>PROPORTION NESTING</u>
	N	N	
1990	8	5	0.63
1991	9	6	0.67
1992	30	27	0.90
1993	33	19	0.58
1994	33	19	0.58
1995	23	6	0.26

TABLE 8b. Proportion of California spotted owl pairs nesting on the Sequoia Kings Canyon National Parks, 1990 - 1995.

YEAR	<u>PAIRS CHECKED</u> <u>FOR NESTING</u>	<u>PAIRS NESTING</u>	<u>PROPORTION NESTING</u>
	N	N	
1990	5	4	0.80
1991	11	2	0.18
1992	27	24	0.89
1993	25	15	0.60
1994	27	16	0.59
1995	31	5	0.16

TABLE 8c. Proportion of California spotted owl pairs nesting on the New Sierra National Forest, 1994 - 1995.

YEAR	<u>PAIRS CHECKED</u> <u>FOR NESTING</u>	<u>PAIRS NESTING</u>	<u>PROPORTION NESTING</u>
	N	N	
1994	11	6	0.55
1995	9	1	0.11

TABLE 9a. Proportion of pairs of California spotted owls checked for reproduction by 15 July which fledged young on the Sierra National Forest, 1990 - 1995.

YEAR	No. Pairs Checked	No. Pairs Which Fledged Young	Proportion of All Pairs Checked Which Fledged Young
1990	18	13	0.72
1991	13	5	0.38
1992	30	26	0.87
1993	33	14	0.42
1994	33	14	0.42
1995	26	1	0.04

TABLE 9b. Proportion of pairs of California spotted owls checked for reproduction by 15 July which fledged young on the Sequoia Kings Canyon National Parks, 1990 - 1995.

YEAR	No. Pairs Checked	No. Pairs Which Fledged Young	Proportion of All Pairs Checked Which Fledged Young
1990	8	7	0.88
1991	12	1	0.08
1992	27	23	0.85
1993	25	11	0.44
1994	29	14	0.48
1995	33	2	0.06

TABLE 9c. Proportion of pairs of California spotted owls checked for reproduction by 15 July which fledged young on the New Sierra National Forest, 1990 - 1995.

YEAR	No. Pairs Checked	No. Pairs Which Fledged Young	Proportion of All Pairs Checked Which Fledged Young
1994	11	5	0.45
1995	14	1	0.07

TABLE 10a. Mean number of young fledged per pair of California spotted owls checked for reproduction by 15 July on the Sierra National Forest, 1990 - 1995.

YEAR	No. Pairs Checked	Number of Young Found	Mean Number of Young Per Pair
1990	18	22	1.22
1991	13	6	0.46
1992	30	52	1.73
1993	33	23	0.70
1994	33	20	0.61
1995	26	1	0.04

Table 10b. Mean number of young fledged per pair of California spotted owls checked for reproduction by 15 July on the Sequoia Kings Canyon National Parks, 1990 - 1995.

YEAR	No. Pairs Checked	Number of Young Found	Mean Number of Young Per Pair
1990	8	12	1.50
1991	12	1	0.08
1992	27	43	1.59
1993	25	15	0.60
1994	29	22	0.76
1995	33	3	0.09

TABLE 10c. Mean number of young fledged per pair of California spotted owls checked for reproduction by 15 July on the New Sierra National Forest, 1990 - 1995.

YEAR	No. Pairs Checked	Number of Young Found	Mean Number of Young Per Pair
1994	11	9	0.81
1995	14	1	0.07

TABLE 11a. Mean number of young fledged per pair of California spotted owls that fledged young on the Sierra National Forest, 1990 - 1995.

YEAR	No. Pairs Checked	No. Fledged Young	Mean Number of Young Fledged Per Pair
1990	13	22	1.69
1991	5	6	1.20
1992	26	52	2.00
1993	14	23	1.64
1994	14	20	1.43
1995	1	1	1.00

TABLE 11b. Mean number of young fledged per pair of California spotted owls that fledged young on the Sequoia Kings Canyon National Parks, 1990 - 1995.

YEAR	No. Pairs Checked	No. Fledged Young	Mean Number of Young Fledged Per Pair
1990	7	12	1.71
1991	1	1	1.00
1992	23	43	1.87
1993	11	15	1.36
1994	14	22	1.57
1995	2	3	1.50

TABLE 11c. Mean number of young fledged per pair of California spotted owls that fledged young on the New Sierra National Forest, 1990 - 1995.

YEAR	No. Pairs Checked	No. Fledged Young	Mean Number of Young Fledged Per Pair
1994	5	9	1.80
1995	1	1	1.00